

Title: Self-powered Rotary Optical Aligning Apparatus

Background of the Invention:

U.S. patent 6,035,757 to Raymond Caluori disclosed a rotary saw cut alignment device including a battery power source carried by a cutting unit, and a beam light source, operatively connected to the power source, and carried by the cutting unit, wherein the light source projects a light beam from the cutting unit directed along the cutting edge of a blade to assist the operator in cutting accurately.

However, this prior art has the following drawbacks:

1. A plurality of batteries (16) and the laser diode assembly (14) should be homogeneously distributed on the circular housing (12) to increase the design and production complexity thereof. If the batteries (16) are not well arranged on the circular housing, unbalance rotation of the equipment will be caused to possibly influence a precision cutting operation.
2. The batteries should be always replaced with new one or should be recharged for keeping an enough electric energy for normally operating the equipment, causing inconvenience for the operator.
3. Since the blade is continuously rotated when cutting an article, the vibration caused during the cutting operation may easily loosen the electrical contacts including the contacts between the laser driving circuit and the batteries, thereby possibly disrupting the cutting operation.

The present inventor has found the drawbacks of the conventional cut alignment device and invented the present optical aligning apparatus.

#### Summary of the Invention:

The object of the present invention is to provide an optical aligning apparatus including: a pendulum disk having a laser illuminator mounted in a lower portion of the pendulum disk, a multiple-pole magnet annularly formed on a collar concentrically secured on a shaft of a rotary machine, an electromagnetic coil device secured in the pendulum disk and rotatably disposed around the multiple-pole magnet formed on the collar; whereby upon rotation of the rotary machine to simultaneously rotate the magnet on the collar secured on the shaft relative to the electromagnetic coil device on the pendulum disk which is gravitationally pendent and stationary, the electromagnetic coil will be electromagnetically induced to produce electricity to power the laser illuminator for projecting a laser optical line to an object for alignment or marking in order to be processed by the rotary machine.

#### Brief Description of the Drawings:

Fig. 1 is a sectional drawing of the present invention.

Fig. 2 is a cross sectional drawing as viewed from Line 2-2 of Fig. 1.

Fig. 3 is an illustration of the present invention when provided for a rotary saw.

Fig. 4 is a sectional drawing of another preferred embodiment of the present invention.

Fig. 5 is a cross sectional drawing when viewed from Line 5-5 of Fig. 4.

#### Detailed Description.

As shown in Figs. 1~3, an optical aligning apparatus of the present invention comprises: a pendulum disk 1; a sleeve 2 annularly secured on a shaft S of a driving motor M of a rotary machine such as a rotary saw B (Fig. 3); a power generator 30 including a multiple-pole magnet 3 concentrically formed on a collar 21 of the sleeve 2, and an electromagnetic coil 4 secured in the pendulum disk 1 and annularly rotatably disposed around the magnet 3; and an optical illuminator 5 mounted in a lower portion of the pendulum disk 1 and electrically connected to and powered by the power generator 30 when rotated for projecting an optical line to an object for alignment or marking purpose. The disk 1 is stationarily pendently hanged on the sleeve 2 and the shaft S.

The pendulum disk 1 includes: a disk center  $X_1$  which is eccentric to a shaft axis  $X_2$  of the shaft S of the driving motor M and the disk center  $X_1$  is positioned below the shaft axis  $X_2$  (Fig. 2), an eccentric hole 10 eccentrically formed in an upper portion of the

pendulum disk 1 and having a bearing 13 formed in a base portion of the disk 1 along a perimeter of the eccentric hole 10 for rotatably engaging the sleeve 2 especially for rotatably engaging a sleeve neck portion 20 (adjacent to the collar 21) of the sleeve 2 having the neck portion 20 annularly secured on the shaft S, a gravity center (not shown) of the pendulum disk 1 formed in a lower portion of the pendulum disk 1 below the shaft axis  $X_2$ ; wherein the multiple-pole magnet 3 is concentrically formed on the collar 21 of the sleeve 2 and simultaneously rotating with the rotation of the shaft S to render as a "rotor" to be rotatably engaged in the electromagnetic coil 4, which is concentrically disposed around the magnet 3 and is secured in an annular recess 10a radially enlarged from the eccentric hole 10 in the pendulum disk 1 which is gravitationally pendent and stationary to allow the electromagnetic coil 4 to serve as a "stator" relative to the "rotor" of the magnet 3. The center  $X_2$  of the eccentric hole 10 is aligned with the shaft axis  $X_2$  of the shaft S.

Upon rotation of the shaft S to rotate the magnet 3 serving as a rotor, a current will be induced electromagnetically by the electromagnetic coil 4 serving as a stator as concentrically disposed about the magnet 3 to power the optical illuminator 5 which is electrically connected to the electromagnetic coil 4 by electric wires (not shown) as embedded or formed in the disk 1.

As shown in Fig. 3, a blade B of a rotary saw is secured to a flange 22 circumferentially formed on the sleeve 2; whereby upon

rotation of the shaft S as driven by the motor M to produce current by the power generator 30 of the present invention, the illuminator 5 provided in a chamber 14 in the disk 1 will be powered by the current from the power generator 30 to project an optical line L aiming at a cutting line (not shown) on an object to be cut by the blade B of the rotary saw.

The present invention may also be utilized in other rotary machines, not limited in this invention.

The disk 1 and all other elements are preferably formed as circular or cylindrical shape to form a compact unit for enhancing smooth operation and ornamental effect.

The optical illuminator 5 may be a laser illuminator, which includes a laser module having a laser diode connected with a rectifying circuit electrically connected to the power generator 30, and a lens such as a cylindrical-surfaced lens in front of the laser diode for projecting a laser optical line for alignment or marking purpose.

As shown in Fig. 2, the optical illuminator 5 is mounted in a chamber 14 inclinedly formed in a lower portion of the pendulum disk 1 for projecting an optical line  $L_1$  downwardly to an object to be mechanically processed.

As shown in Figs. 4, 5, a laser illuminator 5 may be horizontally mounted in a horizontal chamber 141 formed in a lower portion of the pendulum disk 1, a prism 51 formed in front of the laser

illuminator to reflect the laser optical line as projected from the laser illuminator 5 downwardly ( $L_2$ ) through a radial slot 142 in the disk to be projected downwardly to an object. The prism 51 may reflect the laser optical line precisely to the object to be aligned.

The optical line  $L_1$ ,  $L_2$  as projected from the illuminator 5 shall be well oriented to an object to form an alignment line, along which the tool of a rotary machine (such as the blade B of a rotary saw) may be precisely processed (or cut) thereto.

The pendulum disk 1 may be made with metal, alloy or suitable materials by molding or casting process to be gravitationally pendent to provide a stator for the power generator 30 even under high-speed revolution of the rotary machine. The bearing 13 in between the eccentric hole 10 of the disk 1 and the sleeve 2 on the shaft S provides a rotational relationship therebetween, thereby ensuring a smooth rotation relationship between the magnet 3 and the electromagnetic coil 4.

The present invention is superior to the prior art because the power for energizing the illuminator 5 is directly supplied from the power generator 30 formed in situ in the disk 1, without being additionally carried with batteries. Accordingly, the present invention provides a compact self-powered rotary optical aligning instrument for a convenient alignment or marking use.

The present invention may be modified without departing from the spirit and scope of the present invention.